

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Ja-Hum Ku, et al.
Filing Date: Herewith
Title: METHOD OF FORMING A METAL GATE ELECTRODE

CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.10

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11-6-01

Date

Amy Green
Amy Green

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

PRELIMINARY AMENDMENT

Sir:

Prior to prosecution on the merits, please amend the application as follows:

In the Specification

Please amend the specification as follows:

Please replace the paragraph at page 9 lines 1 through 8 with the following rewritten paragraph.

- - Fig. 3B is a cross-sectional view showing a gate metal electrode after the selective oxidation process was performed. As shown in Fig. 3B, exposed surfaces of the silicon 140, 100 are oxidized, so that silicon oxide layer 120a is formed on the surfaces of the silicon. However, the metal layers 150, 160 are minimally oxidized, so that a relatively small size metal oxide layer 120b is formed on a surface of the metal layers 150, 160. Accordingly, whiskers are not formed on the metal oxide layer 120b after the subsequent heating process. - -

Please replace the paragraph at page 9 lines 9 through 17 with the following rewritten paragraph.

-- Fig. 4A is a scanning electron microscope (SEM) graph of a metal gate electrode which is comprised of polysilicon-tungsten nitride-tungsten and formed by a method in accordance with the conventional art. The metal gate electrode is formed by forming a metal gate electrode pattern, performing a selective oxidation process in accordance with the conventional oxidation process and heating the metal gate electrode pattern. The graph is taken after performing the heating process to examine the whiskers. Figs. 4B and 4C are SEM graphs of a metal gate electrode which is formed using a selective oxidation process in accordance with the present invention.--

In the Claims

Please amend the claims as follows:

5. (Amended) The method according to claim 1, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.

Please add the following new claims:

6. (New) The method according to claim 2, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.
7. (New) The method according to claim 3, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.
8. (New) The method according to claim 4, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.

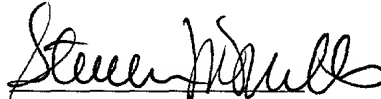
REMARKS

No new matter is added. Entry is respectfully requested.

Attached hereto is a marked-up version of the changes made to the application by the current Amendment. The attached pages are captioned "Version with Markings to Show Changes Made."

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Respectfully submitted,


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Version with Markings to Show Changes Made

In the Specification

The paragraph at page 9 lines 1 through 8 has been amended as follows:

- - Fig. 3B is a cross-sectional view showing a gate metal electrode after the selective oxidation process was performed. As shown in Fig. 3B, exposed surfaces of the silicon [140, 120, 100] 140, 100 are oxidized, so that silicon oxide layer 120a is formed on the surfaces of the silicon. However, the metal layers 150, 160 are minimally oxidized, so that a relatively small size metal oxide layer 120b is formed on a surface of the metal layers 150, 160. Accordingly, whiskers are not formed on the metal oxide layer 120b after the subsequent heating process. - -

The paragraph at page 9 lines 9 through 17 has been amended as follows:

- - Fig. 4A is a [transmission electron microscopy (TEM)] scanning electron microscope (SEM) graph of a metal gate electrode which is comprised of polysilicon-tungsten nitride-tungsten and formed by a method in accordance with the conventional art. The metal gate electrode is formed by forming a metal gate electrode pattern, performing a selective oxidation process in accordance with the conventional oxidation process and heating the metal gate electrode pattern. The graph is taken after performing the heating process to examine the whiskers. Figs. 4B and 4C are [TEM] SEM graphs of a metal gate electrode which is formed using a selective oxidation process in accordance with the present invention.- -

In the Claims

Claim 5 has been amended as follows:

5. (Amended) The method according to [any of claims 1 through 4] claim 1, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.

The following claims have been added:

6. (New) The method according to claim 2, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.
7. (New) The method according to claim 3, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.
8. (New) The method according to claim 4, wherein oxygen gas and hydrogen are used as a source gas in the selective oxidation process.

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